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TOWNSEND AND TOWNSEND AND CREW, LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

| EXAMINER | |
|---|---|
| RUTZ, JARED IAN | |
| ART UNIT | PAPER NUMBER |
| 2187 | |

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/684,210 | SUZUKI ET AL. | |
| | **Examiner** | **Art Unit** | |
| | Jared I. Rutz | 2187 | |

***-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --***

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *07 November 2005*.
2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *13-16,19-22 and 24-33* is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *13-16,19-22 and 24-33* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☒ All b)☐ Some * c)☐ None of:
1.☒ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

1. Claims 13-16, 19-22, and 24-33 are pending in the instant application, claims 17, 18, and 23 having been canceled by the amendment dated 11/07/2005. Applicant's amendments and arguments have been carefully and fully considered, but they are not persuasive. Accordingly, this Office Action is made **FINAL**.

### *Claim Rejections - 35 USC § 112*

2. The amendments to **claims 14 and 22** are sufficient to overcome the rejection of these claims under 35 USC 112 first paragraph. Accordingly, these rejections are withdrawn.

3. The amendments to **claims 13, 14, 21, and 22** are sufficient to overcome the rejection of these claims under 35 USC 112 first paragraph. Accordingly, these rejections are withdrawn.

### *Claim Rejections - 35 USC § 102*

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. **Claims 13-16, 19-22, and 24-33** are rejected under 35 U.S.C. 102(e) as being anticipated by Cabrera et al (US 6,708,227) and Kusters et al (6,473,775), which is incorporated by reference in Cabrera, and the Microsoft Computer Dictionary (2002

Microsoft Press) is relied upon as an evidentiary reference for the meaning of the term "flag".

6. **Claim 13** is taught by Cabrera as:

a. *A storage system, comprising: a plurality of disk drives.* Column 3 lines 47-49 show that the invention acts to coordinate/manage multiple different volume snapshot providers. Column 4 lines 55-62 show that the multiple volumes shown in figure 2 may be multiple disk drives.

b. *A controller coupled to an information processing device and for transferring data sent from the information processing device to a first plurality of logical volumes relating to the disk drives; and for controlling a first group having both the first plurality of logical volumes and a second plurality of logical volumes.* See the Volume Snapshot Service Coordinator described in column 4 lines 37-42. The VSSC provides a consistent API to allow a host computer to interface with a plurality of storage devices. See figure 5, which shows multiple storage regions O1 to On, discussed in column 5 lines 55-57. See also column 2 lines 26-30, which show that when a write is made to an allocation unit that is part of a snapshot, the original data is copied to a differential file. The volumes that are part of the snapshot correspond to the first storage regions, and the differential files correspond to the second storage regions. Column 9 lines 48-52 show that multiple volumes can be combined to form a snapshot set, which corresponds to the first group.

c. *Wherein the controller processes to receive a command sent to the first group.* The split command as taught by page 12 lines 12-27 of the instant application is equivalent to taking a snapshot in that the second volume will contain only the data present in the second volume at the time of the split. Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. Therefore, it is inherent that the VSSC is configured to receive the split command sent to the first group.

d. *Start, in accordance with the command, changing from a first status to a second status in which a relationship between the first plurality of logical volumes and a second plurality of logical volumes is split.* Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. This means that the storage regions in the group change from a first status, in which all writes to the first plurality are written to the second plurality, to a second status, in which no writes are made to the second plurality.

e. *Receive a write command sent from the information processing device to a first logical volume of the first plurality of logical volumes during a period of changing from the first status to the second status.* Column 2 lines 41-42 incorporates by reference US patent application 09/505,450, now US patent 6,473,775 to Kusters et al. Kusters is provided as background information relating to snapshot services related to the disclosed invention of Cabrera. Cabrera discloses via Kusters column 1 lines 61-64 that a snapshot with a differential file can be created without suspending writes. Therefore, it is inherent that the controller is configured to receive a write command while changing from the first status to the second.

f. *Write data related to the write command to the first logical volume and not write the data related to the write command to a second logical volume of the second plurality of logical volumes relating to the first logical volume based on receiving the write command.* Kusters column 1 lines 22-30 shows that the snapshot system is a copy on write (see figure 6), which saves a snapshot as a point in time copy of the first volume. When the volumes are split, writes made to the first volume are not made to the second volume. To allow the volumes to remain separate, the data stored in the first volume before the write is made is copied to the differential file, which results in the data being written to the first volume but not the second volume.

g. *Complete changing from the first status to the second status after writing data related to the write command to the first logical volume.* Kusters column 1 lines 22-30 shows that the snapshot system is a copy on write (see figure 6), which saves a snapshot as a point in time copy of the first volume.

h. *And wherein consistency of data stored in the second plurality of logical volumes in the second status is maintained.* Kusters column 1 lines 13-16 show that a snapshot is a copy of the data in a volume at a point in time. Column 1 lines 22-26 shows the copy-on-write method used to ensure data in the first volume is copied to the second volume to manage the snapshot at a point in time.

7. **Claim 14** is taught by Cabrera as:

i. *Wherein the controller splits sequentially each relationship between each of the first plurality of storage regions and each of the second plurality of storage regions during changing from the first status to the second status.* Column 9 lines 48-52 shows that all the snapshots in the set relate to the same point in time. Therefore, the relationship between each of the first plurality of storage regions and their corresponding second volumes is split in an order to change from the first status to the second status.

8. **Claim 15** is taught by Cabrera as:

j. *Wherein, in accordance with receiving the write command, the controller checks whether a relationship between the first logical volume and the second logical volume is split.* Kusters column 8 line 65 to column 9 line 2 shows that the controller checks to see if the data being written is of interest, i.e., if it is a new write to a volume that is part of a snapshot.

9. **Claim 16** is taught by Cabrera as:

k. *Wherein the controller is able to write data stored in the first logical volume to the second logical volume, if the controller receives the write command and a relationship between the first logical volume and the second logical volume is not split.* Column 8 lines 17-20 show that the invention disclosed by Cabrera may use a split-mirror technique for snapshots. A split-mirror technique keeps the first and second volumes synchronized by copying all writes to the first volume to the second volume until the two volumes are split to form a full snapshot.

10. **Claim 19** is taught by Cabrera as:

l. *Wherein the controller receives a write command or a read command sent to the second logical volume.* Column lines 30-35 shows that the snapshot is accessible, i.e., it can be read from and written to.

11. **Claim 20** is taught by Cabrera as:

m. *Wherein the first status is a pair status in which data stored in the first plurality of logical volumes are copied to the second plurality of logical volumes.* Column 8 lines 17-20 show that the invention disclosed by Cabrera may use a split-mirror technique for snapshots. A split-mirror technique keeps the first and second volumes synchronized by copying all writes to the first volume to the second volume until the two volumes are split to form a full snapshot.

12. **Claim 21** is taught by Cabrera as:

n. *Wherein the relationship between the first plurality of logical volumes and the second plurality of logical volumes is split and the consistency among data stored in the first plurality of logical volumes will be maintained with respect to the current time and the consistency among data stored in the second plurality of logical volumes will be maintained with respect to the point in time related to the command.* Column 2 lines 30-35 show that the state of the first volume at the time the snapshot is taken is accessible; therefore it is maintained with respect to the point in time that the split command was issued. Column 1 lines 22-26 shows the copy-on-write method used to ensure data in the first volume is copied to the second volume when it is updated to manage the snapshot at a point in time. This shows that the first volume is written to, and thus maintained with respect to the current time.

13. **Claim 22** is taught by Cabrera as:

o. *Wherein the plurality of logical volumes include a second group having both third plurality of logical volumes and a fourth plurality of logical volumes.* Figure 6 shows multiple snapshot sets as explained in column 8 line 66 to column 9 line 10.

p. *And a relationship between the third plurality of logical volumes and the fourth plurality of logical volumes is split based on another command.* For the purpose of this examination, the limitation will be interpreted as "And a relationship between the third plurality of storage regions and a fourth plurality of storage regions related to a second group is split based on another split command." Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. The snapshot command is made to a snapshot set. Therefore, it is inherent that the VSSC can issue a split command to the second group, thus splitting the relationship between the third plurality of storage regions and the fourth plurality of storage regions.

14. **Claim 24** is taught by Cabrera as:

q. *A storage system comprising a plurality of storage regions which include a consistency group having both a first plurality of storage regions and a second plurality of storage regions.* See figure 5, which shows multiple storage regions O1 to On, discussed in column 5 lines 55-57. See also column 2 lines 26-30, which show that when a write is made to an allocation unit that is part of a snapshot, the original data is copied to a differential file. The volumes that are part of the snapshot correspond to the first storage regions, and the differential files correspond to the second storage regions.

r. *The consistency group being used to maintain consistency among data stored in the second plurality of storage regions.* The snapshot sets described in column 9 lines 48-52 are equivalent to the consistency group.

s. *A plurality of disk drive units having a plurality of disk drives which corresponds to the plurality of storage regions.* Column 3 lines 47-49 show that the invention acts to coordinate/manage multiple different volume snapshot providers. In the context of the reference, this shows that multiple different storage devices, each containing one or more disk drives as known to one of ordinary skill in the art, can be used together and treated as a single storage and snapshot system. See column 3 lines 1-38 for an explanation.

t. *A controller coupled to an information processing device and transferring data sent from the information processing device to the plurality of storage regions.* See the Volume Snapshot Service Coordinator described in column 4 lines 37-42. The VSSC provides a consistent API to allow a host computer to interface with a plurality of storage devices.

u. *Wherein the controller is configured to receive a split command sent to the consistency group, the split command being used to split a relationship between the first plurality of storage regions and the second plurality of storage regions.*

The split command as taught by page 12 lines 12-27 of the instant application is equivalent to taking a snapshot in that the second volume will contain only the data present in the second volume at the time of the split. Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. Therefore, it is inherent that the VSSC is configured to receive the split command sent to the first group.

v. *Start changing a split status in which a relationship between the first plurality of storage regions and the second plurality of storage regions is split.* Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. This means that the storage regions in the group change from a first status, in which all writes to the first plurality are written to the second plurality, to a second status, in which no writes are made to the second plurality.

w. *Receive a plurality of write commands sent from the information processing device to at least one first storage region of the first plurality of storage regions after starting to change to the split status.* Kusters column 1 lines 61-64 shows that a snapshot with a differential file can be created without suspending writes. Therefore, it is inherent that the controller is configured to receive a write command while changing from the first status to the second.

x. *Be able to copy data stored in the first storage region to a second plurality of storage regions after receiving the write commands.* Kusters column 1 lines 22-30 shows that the snapshot system is a copy on write (see figure 6), which saves a snapshot as a point in time copy of the first volume.

y. *And write data related to each of the write commands to the first storage region and not write the data related to each of the write commands to the second storage region, each time or receiving each of the write commands.* In a copy on write snapshot system, the new data will be written to the first volume after the data from the first volume is copied to the second volume, thus copy on write.

15. **Claim 25** is taught by Cabrera as:

z. *A plurality of disk drives.* Column 3 lines 47-49 show that the invention acts to coordinate/manage multiple different volume snapshot providers. In the context of the reference, this shows that multiple different storage devices, each containing one or more disk drives as known to one of ordinary skill in the art, can be used together and treated as a single storage and snapshot system. See column 3 lines 1-38 for an explanation.

aa. *And a controller for transferring data to a first plurality of logical volumes relating to the disk drives, and for controlling a consistency group having both the first plurality of logical volumes and a second plurality of logical volumes, in which a consistency among data stored in the second plurality of logical volumes is maintained, if a relationship between the first plurality of logical volumes and the second plurality of logical volumes is split.* See figure 5, which shows multiple storage regions O1 to On, discussed in column 5 lines 55-57. See also column 2 lines 26-30, which show that when a write is made to an allocation unit that is part of a snapshot, the original data is copied to a differential file. The volumes that are part of the snapshot correspond to the first storage regions, and the differential files correspond to the second storage regions. The differential file is maintained as a point in time copy of the first volume.

bb. *Wherein the controller processes to receive a split command sent to the consistency group, the split command being used to split a relationship between the first plurality of logical volumes and the second plurality of logical volumes.* The split command as taught by page 12 lines 12-27 of the instant application is equivalent to taking a snapshot in that the second volume will contain only the data present in the second volume at the time of the split. Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. Therefore, it is inherent that the VSSC is configured to receive the split command sent to the first group.

cc. *Start changing to a split status in which a relationship between the first plurality of logical volumes and the second plurality of logical volumes is split.* Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. This means that the storage regions in the group change from a first status, in which all writes to the first plurality are written to the second plurality, to a second status, in which no writes are made to the second plurality.

dd. *Receive a write command sent to a first logical volume of the first plurality of logical volumes after starting to change the split status.* Kusters column 1 lines 61-64 shows that a snapshot with a differential file can be created without suspending writes. Therefore, it is inherent that the controller is configured to receive a write command while changing from the first status to the second.

ee. *Be able to copy data stored in the first logical volume to a second plurality of logical volumes.* Kusters column 1 lines 22-30 shows that the snapshot system is a copy on write (see figure 6), which saves a snapshot as a point in time copy of the first volume.

ff. *And write data related to the write command to the first logical volume after changing to a split status in which a relationship between the first logical volume and the second logical volume is split, the data related to the write command being not written to the second logical volume on receiving the write command.* In a copy on write snapshot system, the new data will be written to the first volume after the data from the first volume is copied to the second volume, thus copy on write.

16. **Claim 26** is taught by Cabrera as:

gg. *A storage system comprising a plurality of logical regions which include a consistency group in which a relationship between a first plurality of logical regions of the plurality of logical regions and a second plurality of logical regions related to the first plurality of logical regions is split based on a received command.* See figure 5, which shows multiple storage regions O1 to On, discussed in column 5 lines 55-57. See also column 2 lines 26-30, which show that when a write is made to an allocation unit that is part of a snapshot, the original data is copied to a differential file. The volumes that are part of the snapshot correspond to the first storage regions, and the differential files correspond to the second storage regions.

hh. The split command as taught by page 12 lines 12-27 of the instant application is equivalent to taking a snapshot in that the second volume will contain only the data present in the second volume at the time of the split. Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. Therefore, it is inherent that the VSSC is configured to receive the split command sent to the first group.

ii. *A plurality of disk drive units having a plurality of disk drives which corresponds to the first plurality of logical regions.* Column 3 lines 47-49 show that the invention acts to coordinate/manage multiple different volume snapshot providers. In the context of the reference, this shows that multiple different storage devices, each containing one or more disk drives as known to one of ordinary skill in the art, can be used together and treated as a single storage and snapshot system. See column 3 lines 1-38 for an explanation.

jj. *A controller configured to transfer data to the plurality of logical regions wherein the controller is configured to receive the command sent to the consistency group.* The split command as taught by page 12 lines 12-27 of the instant application is equivalent to taking a snapshot in that the second volume will contain only the data present in the second volume at the time of the split. Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. Therefore, it is inherent that the VSSC is configured to receive the split command sent to the first group.

kk. *Start changing to a split status in which the relationship between the first plurality of logical regions and the second plurality of logical regions is split.* Column 9 lines 48-52 show that all the snapshots in the set relate to the same point in time. This means that the storage regions in the group change from a first status, in which all writes to the first plurality are written to the second plurality, to a second status, in which no writes are made to the second plurality.

ll. *Receive a write command sent to a first logical region of the first plurality of logical regions after starting to change to the split status.* Kusters column 1 lines 61-64 shows that a snapshot with a differential file can be created without suspending writes. Therefore, it is inherent that the controller is configured to receive a write command while changing from the first status to the second.

mm. *Be able to copy data stored in the first logical region to a second logical region of the second plurality of logical regions.* Kusters column 1 lines 22-30 shows that the snapshot system is a copy on write (see figure 6), which saves a snapshot as a point in time copy of the first volume.

nn. *Write data related to the write command to the first logical region but not to the second logical region, if the controller receives the write command.* In a copy on write snapshot system, the new data will be written to the first volume after the data from the first volume is copied to the second volume, thus copy on write.

17. **Claim 27** is taught by Cabrera as:

oo. *The controller writes the data related to the write command to a cache memory in which the data related to the write command are temporarily stored for writing the data related to the write command to the first logical volume.* Kusters column 8 lines 60-64 show that then the snapshot driver receives a request it holds the write while it determines if the write is directed to a portion of the base volume that is part of a snapshot that has not been copied to the differential file.

18. **Claim 28** is taught by Cabrera as:

pp. *The controller writes the data related to the write command to the first logical volume after changing to a second status in which a relationship between the first logical volume and the second logical volume is split.* As shown in figure 6, the write is held while data is copied to the differential file if necessary. In step 612, the data is written to the base volume.

19. **Claim 29** is taught by Cabrera as:

*qq. The controller sets a flag based on receiving the command.* Column 4 lines 49-58 shows that the VSSC can query the list of snapshots. Examiner is not aware of a specific definition for the term "flag" within the specification. Accordingly this term will be given its ordinary meaning to one of ordinary skill in the art. A flag, according to the Microsoft Computer Dictionary, is a marker of some type used by a computer in processing or interpreting information. The presence of a volume listed as having or being a snapshot in a list of snapshots is a form of a flag.

rr. *The controller changes to a second status in which a relationship between the first logical volume and the second logical volume is split, if the flag is set.* The relationship between the first and second volumes is split when the second volumes is maintaining a point-in-time copy of the first volume, i.e. a snapshot. A snapshot list as mentioned at column 4 lines 49-58 would be a list of volumes having or being snapshots. If a volume is listed in the snapshot list as being a snapshot, writes to it are handled in a different manner than if the volume is not a snapshot as indicated by figure 6.

ss. *And the controller writes data related to the write command to the first logical volume after the relationship between the first logical volume and the second logical volume changes to the second status.* In step 606 of figure 6 the controller determines if the write is to data of interest, i.e. an update to data that needs to be maintained as a PIT copy. In step 608 the old data is copied to the differential file, which is after it is determined if the write is to an area of interest and therefore after the relationship between the first and second volume is changed to the second status.

20. **Claim 30** is taught by Cabrera as:

tt. *The controller sets a flag based on receiving the command.* Column 4 lines 49-58 shows that the VSSC can query the list of snapshots. A flag, according to the Microsoft Computer Dictionary, is a marker of some type used by a computer in processing or interpreting information. The presence of a volume listed as having or being a snapshot in a list of snapshots is a form of a flag.

uu. *The controller does not write data related to the write command to the second logical volume, if the flag is set.* In figure 6, the data originally held in the area to be written to is copied to the differential file, and the write is performed to the area. By copying the data to the differential file, the second volume, i.e. the snapshot, contains the old data, and the first volume contains the new data. Therefore, the write is made to the first volume and not the second volume.

21. **Claim 31** is taught by Cabrera as:

vv. *The controller splits each relationship between each of the first plurality of storage regions and each of the second plurality of storage regions in accordance with the order in which the splits are performed, during changing to the split status.* Column 9 lines 48-52 shows that all the snapshots in the set relate to the same point in time. Therefore, the relationship between each of the first plurality of storage regions and their corresponding second volumes is split in an order to change from the first status to the second status.

22. **Claim 32** is taught by Cabrera as:

ww. *The controller splits each relationship between each of the first plurality of logical volumes in accordance with the order in which the splits are performed, during changing to the split status.* Column 9 lines 48-52 shows that all the snapshots in the set relate to the same point in time. Therefore, the relationship between each of the first plurality of storage regions and their corresponding second volumes is split in an order to change from the first status to the second status.

23. **Claim 33** is taught by Cabrera as:

xx. *The controller splits each relationship between each of the plurality of logical regions and each of the second plurality of logical regions in accordance with the order in which the splits are performed, during changing to the split status.* Column 9 lines 48-52 shows that all the snapshots in the set relate to the same point in time. Therefore, the relationship between each of the first plurality of storage regions and their corresponding second volumes is split in an order to change from the first status to the second status.

### *Response to Arguments*

24. Applicant's arguments with respect to claims 13-16, 19-22, and 27-30 have been carefully and fully considered, however they are only partially persuasive.

25. In the fourth paragraph of page 9, Applicant argues that Cabrera does not teach or suggest to write data related to the write command to the first logical volume and not write the data related to the write command to a second logical volume of the second plurality of logical volumes relating to the first logical volume based on receiving the write command during a period of changing from a first status to a second status. The examiner respectfully disagrees. The disclosure of Cabrera relates to a controller

operating at a higher logical level than a snapshot controller, and does not in and of itself discuss snapshot methods. Instead, Cabrera includes by reference other patent applications to teach the specifics of snapshot techniques, including 09/505,450 to Kusters et al, now US 6,473,775. As the Kusters reference is incorporated into the disclosure of Cabrera, the teachings of the Kusters reference are also taught by Cabrera.

26. In the first full paragraph of page 10, Applicant argues that Cabrera teaches to hold writes for committing the snapshots. The examiner agrees. However, the invention disclosed by Cabrera is designed to serve as an interface between an upper level system and multiple snapshot providers (Cabrera column 3 lines 41-61). Cabrera column 5 lines 31-35 show that the purpose of holding writes, i.e. separating the prepare and commit phases of snapshot generation, is "*to allow mixing of differential snapshots with split-mirror snapshots, and other snapshots having differing timing*". However, not all storage systems use all types of snapshot providers. Column 5 lines 5-9 show as an example that in a system that uses only software snapshot providers the invention can perform differently, in this example by changing the way it handles hardware snapshot providers. In a system using only snapshot providers as taught by Kusters, there is no need to separate the prepare and commit phases of snapshot generation as there is no mixing of snapshot providers having different timing that needs to be allowed.

27. In the third paragraph of page 10, Applicant argues that although Kusters explicitly states that it "*provides a system and method for creating a snapshot with a*

*differential file without suspending writes*" at column 1 lines 61-63, Kusters actually teaches that it is necessary to suspend writes to the region allocated to the differential file. The examiner agrees, but respectfully disagrees with Applicant's interpretation of the invention of Kusters. Space is allocated to the differential file from the base volume. However, the differential file, once space is allocated to it, is not a part of the first volume. Kusters column 6 lines 27-33 show that the snapshot volume is the logical combination of the data stored on the base volume modified by difference data stored in the differential file. Accordingly, preventing writes to the region allocated to the differential file does not mean that writes are suspended to any portion of the base volume, as the region allocated to the differential file is not logically a part of the first volume.

28. Also in the third paragraph of page 10, Applicant argues that "data is written somewhere else first, and then copied to the differential file". The examiner respectfully disagrees. The differential file holds a version of the data held in the base volume, i.e. the first volume, at the point in time that the snapshot was taken if that data is changed at a point in time later than the snapshot point. Data from a write made to the base volume made after the snapshot point is not copied to the differential file, the older version of the data that is being overwritten is copied to the differential file (Kusters column 1 lines 21-30). See the explanation of figure 6 beginning at column 8 line 48 and ending at column 9 line 30.

29. Applicant makes the same arguments as discussed supra with respect to claims 24-26 and 31-33 on pages 11-13, and the examiner respectfully disagrees for the reasons stated supra.

## *Conclusion*

30. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jared I. Rutz whose telephone number is (571) 272-5535. The examiner can normally be reached on M-F 8:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on (571) 272-4201. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jared I Rutz
Examiner
Art Unit 2187

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**DONALD SPARKS**
**SUPERVISORY PATENT EXAMINER**